

Types of Chemical Reactions

Name _____

Date _____ Block _____

Purpose:

1. To review nomenclature, balancing equations, reaction types, predicting products and evidence for chemical reactions.
2. To improve observation skills and confirm phases of reactants and products.

Prelab Exercise:

1. Identify and write down the reaction type first:
 - a. simple composition (synthesis)
 - b. simple decomposition
 - c. single replacement
 - d. double replacement
 - e. hydrocarbon combustion
 - f. other
2. Complete the balanced chemical equation next including the state of matter.
3. Complete the word equation last.

Procedure:

1. Describe the reactants before observing the reaction: i.e., color and state (gas, liquid, solid, or aqueous solution).
2. Follow the instructions to obtain the required chemical reaction.
3. Describe the products after observing the reaction: i.e., color and state.
4. Indicate the evidence that a chemical reaction has occurred:
 - a. a precipitate forms
 - b. a color change occurs
 - c. an energy change occurs
 - d. a gas is produced.
5. Clean up the laboratory station and then move on to the next station.

Postlab:

1. Be prepared to describe the reactants, the products and the chemical reaction for the next day.
2. Be prepared to compare the predicted to the actual states of matter.

Example:

As the prelab assignment complete the reaction type, balanced equation and word equation from the given partial word equation.

Reaction type: Single replacement

Balanced equation: $Mg_{(s)} + 2HCl_{(aq)} \rightarrow H_{2(g)} + MgCl_{2(aq)}$

Word equation: magnesium + hydrochloric acid \rightarrow hydrogen + magnesium chloride

When in the laboratory complete the descriptions and reaction evidence.

Descriptions: light solid colorless aqueous colorless gas colorless aqueous
covered with white oxide solution solution

Reaction evidence: gas produced, perhaps some heat also: magnesium disappears

CHEMICAL REACTIONS

Station 1

Obtain a blue flame with the bunsen burner. Use tongs to hold a small length of magnesium ribbon in the bunsen burner flame. When the magnesium ribbon ignites *do not stare at the flame*. Hold the burning magnesium over a beaker or asbestos pad. Leave the bunsen burner lit (with a visible, yellow flame).

Do not stare at the flame.

Reaction type: _____

Balanced equation: _____ + _____ \rightarrow _____

Word equation: magnesium + oxygen \rightarrow _____

Descriptions: _____

Reaction evidence: _____

Station 2

Observe the burning candle. What is the state of matter of each of the reactants and products? Hold a beaker full of cold water over the flame. Record the observations. Leave the candle lit when leaving the station. Clean the beaker.

Reaction type: _____

Balanced equation: $C_{25}H_{52} +$ _____ \rightarrow _____ + _____ + _____

Word equation: candle wax + oxygen \rightarrow _____ + _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 3

Use tweezers to add a piece of mossy zinc to the beaker containing hydrochloric acid. Record the observations. Use the tweezers to remove the piece of zinc. Return the zinc to the container. Leave the hydrochloric acid in the beaker. (*Caution: Do not get any acid on hands or clothes.*)

Reaction type: _____

Balanced equation: _____ + _____ → _____ + _____

Word equation: zinc + hydrochloric acid → _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 4

Put a piece of red litmus paper into some water in a beaker. Use tweezers to add a small piece of calcium to the water in the beaker. Record the observations. Use the tweezers to remove the litmus paper and calcium from the beaker. Put the litmus and the calcium in the beakers provided. Pour the water down the sink and rinse the beaker.

Reaction type: _____

Balanced equation: _____ + _____ → _____ + _____

Word equation: calcium + water → _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 5

Add an eyedropper-full of each solution to a small test tube. Record the observations. Rinse out the test tube.

Reaction type: _____

Balanced equation: _____ + _____ → _____ + _____

Word equation: cobalt(II) chloride + sodium hydroxide----> _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 6

Measure out 25 ml of sodium carbonate in a 100 ml beaker. Pour out 25 ml of calcium chloride solution into a second 100 ml beaker. Pour both together into a clean 250 ml beaker. Rinse out each beaker with clean water.

Reaction type: _____

Balanced equation: _____ + _____ \longrightarrow _____ + _____

Word equation: sodium carbonate + calcium chloride \longrightarrow _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 7

Using separate scoopulas, put a small quantity (1 cm along the scoop) of barium hydroxide and ammonium chloride into a 100 ml beaker. Using a glass stirring rod, stir the two chemicals together for two minutes. Touch the base of the beaker to your bare forearm. Rinse out and dry the beaker and stirring rod.

Reaction type: _____

Balanced equation: _____ + _____ \longrightarrow _____ + _____

Word equation: barium hydroxide + ammonium chloride \longrightarrow _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 8

Place a small amount of white table sugar in a test tube. Using a test tube holder, carefully heat the test tube until the sugar is completely burned, using a bunsen burner. Using a wooden splint, taste the burnt sugar. What is it? Did the change in chemical composition affect the flavour? Notice the droplets on the side of the test tube. Clean the test tube with the test tube brush provided.

Reaction type: _____

Balanced equation: $C_{12}H_{22}O_{11}$ + heat \longrightarrow _____ + _____

Word equation: _____ glucose + heat \longrightarrow _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 9

Tie a string around a galvanized or uncoated nail. Fill a beaker half full with blue copper sulphate. Dip the nail in the solution for about five minutes. Observe the colour change of the nail. Continue to dip the nail into the solution. Take the nail out and place in the disposal container before the next rotation of stations.

Reaction type: _____

Balanced equation: _____ + _____ \rightarrow _____ + _____

Word equation: copper (II) sulphate + iron \rightarrow _____ + _____

Descriptions: _____

Reaction evidence: _____

Station 10

Place a clean silver article in the egg yolk (has small amounts of sulphur in it) and stir. Allow it to sit for about twenty minutes. Remove, rinse with water and observe.

Reaction type: _____

Balanced equation: _____ + _____ \rightarrow _____ + _____

Word equation: silver + sulphur \rightarrow _____

Descriptions: _____

Reaction evidence: _____

Discussion:

1. What can affect the speed of these reactions?
2. How can you tell how many products have formed?
3. Why were all the reactants not used up?
4. What reaction was the most violent? How can you tell?
5. Can we reverse any of these reactions? How? Why?
6. Classify the following reactions:

1. $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
2. $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$
3. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
4. $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$
5. $\text{Al}_2\text{O}_3 \rightarrow \text{Al} + \text{O}_2$
6. $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
7. $\text{Au} + \text{O}_2 \rightarrow \text{Au}_2\text{O}_3$
8. $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{C} + \text{H}_2\text{O}$
9. $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
10. $\text{Pb}(\text{NO}_3)_2 + \text{KI} \rightarrow \text{PbI}_2 + \text{KNO}_3$
11. $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
12. $\text{MgCO}_3 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

7. What are some of the challenges in this experiment?
8. What worked well?